Notebook Series -- Notebooks by Edison
Notebook, N-19-04-22

This notebook was used by Edison in April 1919. The entries relate to the preparation of iron mix for use in the negative electrode pockets of storage batteries; the mix was made from pure iron and 3 percent yellow mercuric oxide. Included are experiments performed on red iron oxide identified as "giving us trouble at factory." Other experiments involve the iron sulphate used in the production of that iron oxide. Also included are reminders to direct "Miller" (probably Edison's brother-in-law John V. Miller, manager of the Edison Chemical Works) to perform tasks or collect information, along with a list of matters to investigate further. One entry summarizes the results from storage battery tests recorded "from old books," one of which was N-19-04-20.1. The front cover is labeled "Very Important," "Iron Mix Experiments," and "April 22 1919." The pages are unnumbered. Only 18 pages have been used.

April 22

1= Set up device, after screening large pieces of Red Ox to size to crush several particles one at time to ascertain density -

2= Is red iron tested for Sulphates, if sulphur left it binds + makes particles less porous -

3 Is hydraulic presses daily Checked at Orange - also small press -

4 - Is our Manganese test reliable.

		High	Low
5. Average Lwts	Slake	17.6	13.3
	Orange	29.1	18.5

Supposed both machines alike - Why such diference on same batch of mix

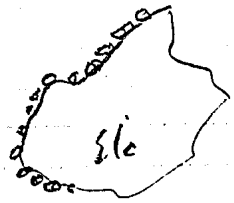
6 = What is method of quick testing for Mn –

7 = Does accumulator weights vibrate in pressing pockets

8 What has become of test of A4 without Corrugating This was ordered 2½ months ago – I never get any reports of test Coils although over a dozen tests of various kind were ordered, Why –

9 On washing red iron & washing away the very fine, I find on drying that at least 15% of the lumps when broken show steel like Colors & not red, Outside is red

10 – On washing acct fines from iron mix & then drying I find that the outside of lumps has fused iron globules from high temperature.



Either this is iron or a fused impurity oozing out – or Mercury If iron its inert.

11 I find that the washed Mix – using distilled water & residue on watch glass that when dried the particles of mix are cloaked together by Ferric hydroxide, which is not only inert but is an insulator – apparently on self heating no water should

be used except in a very fine fog — any great amount will on evaporation cover the finer particles with ferric hydroxide & insulate them —

I washed the mix with very dilute NaOH, on drying there is no ferric hydroxide & all is black

Am trying it with Ammonia — tried no ferric hyd black, no residue this is ideal if ok otherwise —

Miller should keep 3 months supply Rockets 5 + 7 gram & preserve ½ dog for future Examination —

Roasted Ferrous Sulphate does not turn green when put in water —

10 grms Mny soaked in distilled water, then filtered gives a white residue on evaporation on watch glass. about 2 milgrms -

Find out record of A 4 Cells on test without Corrugating -

ditto Cells which have no Nickel plating on any part,

See if Miller has small evaporating apparatus & roasting dish & have him make batches.

90 $FeSO_4$ 10 Mg Sulfate
90 " 30
50 " 50

Drive off water from Crystals
Roast reduce self heat
& make test pkts.

Miller take some reg mix before
self heat & self heat with 1/2 of
% of NaOH another
lot 1% Ammonia —
If he can't do this but must
use pat full do that,
Put in H_2O after self heated
& cold —

Quakies roasted Sulphate
has very few fines & that it
granulates - 95% thru 40 mesh
& the fines are 60 mesh
hardly trace of 150 mesh

This could be aged & roasted
stopping fines & chunk -

Jack Rea Red iron roasted
4 hours which is now giving
us trouble at factory giving
only 1400 to 5 grams
This red has lot of black particles
in it - On 20 mesh has the
most should say 20%
on 40 has 10% on 180 dont
show any.
Probability is that nearly
all is that thru 80 mesh
hard any - by washing
the on 20 mesh with fingers

treated on big watch glass
the red is gradually washed
away it being more spongy
While the black to brown is
very much harder & dense
Under Microscope the black
shows very fine globules in fact
its masses of globules showing
fusion, its otherwise
A lot which was roasted
3 hours & also a lot
2 3/4 hours gave no black
particles by rubbing on
watch glass -

The best way to bring
out black is to take several
grams ~~[illegible]~~ size & then fuse
in Coro HCl at a gentle
heat until 3/4 has ~~[illegible]~~
dissolved leaving then
the black is easily seen
as its not affected as
Easily as the Red
3 hours or 2 3/4 hours

roast is best,

The 3 hour roast will be more friable than 4 hours, hence after being reduced by hydrogen the Chilean mill should be run only enough to bring the right fine for loading — that is now 20 minutes no matter what the friability of roast is. If friable 20 minutes will make it so fine cant load it. Whereas if the mixing time is gauged by screening the mix. 3 5 & 10 minutes the mill will bring it to right mesh so most friable ores will load

The dried sulphate should be screened thru 5 mesh as the big particles that gross most black

I notice in 10 hours –
5/16 + smaller Sulphate at
a very gentle heat.
2 bottles dishes one on top
of the other. quite fully
dehydrated (10) 6 waters
+ very porous + white
not oxidized — This white
seems strong enough &
can be heated right up to
red without puffing —

Think a shelf drying
Room with heat + good
ventilation will do it
perfectly without making
fines to bother

I put some $FeSO_4$ Crystal 1/4" of them in Vac Dryer 26" Hg — 1 hour and temp, did nothing —

Put in 1 hour at 160° Fahr whitened around edges, probably if 1/4 it would be finished in 3 hours — This Experiment is no I think because we used a water pump & bottle ~~[illegible]~~ wants a pump —

In Open butter dish 2 high (10) on on top of the other I put on hot plate with $FeSO_4$ Crystals 1/8 thick then 8 mesh at 3 pm it was dehydrated & all white throughout, laid thermometer in the granules & resting on dish gives 58° — Centigrade — air perfectly still. The lumps are not friable & will stand a lot without making fines — Put right on red hot plates screen 0004 Bunsen burner dont melt —

If 1/8 mesh stuff is put say 1/4 thick on shelves in room at 60 cent & the air freely circulated The whole will be OK in 3 to 4 hours,

If Rotary dryer used, can use it Blow Rest & do same thing. but not so perfect.

By using 1/8" Crystals the surface is increased many times over what we have now & the drying time enormously diminished

I find that iron by H. taken out of pot wet & dried in thin layer on pie plate at ordinary temperature

is litterally covered with yellow ferric hydroxide, This is very bad.

There is now doubt but what in our present process of self healing we make from 5 to 10% of ferric hydrox which is irreducible electrically an insulator This hydrox is not only on surface of the particles but must be in the pores

I suggest ~~[illegible]~~ Centrifuging to get off all the water possible & drying in air

Possibly washing with alcohol to remove remaining water

Or Centrifuging & having NaOH in water put in pat originally

Displacing the water
by Denatured alcohol
it still dries Reddish
Showing Denat alcohol
will not do —

So far the NaOH is ok
but not yet dry -

The dried Reduced by H +
water in pot,
I pressed this considerably
in bottom of pie dish
to break up big lumps
after that screened it —
Most was on 20 mesh
2nd on 60 — 3rd on 100
+ very little thru 170
+ all brownish red

Took some of the on 20 mesh ground fine + it became black, showing most of the ferric hydrox is on the surface —

There is now doubt that no matter how friable the ore is, that by proper crushing of the reduced by H, there need not be many fines + that there should be no trouble to get easy loading mix by controlling degree of crushing —

April 29/19

Took 3 lots of Fr Leg H wet

I noticed red ferric on outside of dumps but black inside due to air getting in Can

Each lot I crumpled up & put in Beaker.

1st added 1/2 % NaOH + cor water
2 " 1 % "
3 " 2 % "

Let it soak for 15 min
poured water off left mix
Separating wet put out on
Watch glass 6" to dry
in Bench - at 3 pm -
at 6 pm only 1/2 dried, gone
for the day - probably 10 hours
to dry

after drying all night

all dry

½% NaOH, decidedly brown
some pieces gone cobally red

1% shade Brownish red

2% faint tint,
under microscope looks all
metallic Can't see any red

2½% NaOH, will certainly
do the business in the pot

NOTE

It would be an advantage I
think to get the particles a
little more porous, This
Could be done by screening
Then 8 mesh & air dry
warm air — of the FeSO4

NOTE

Record from old Books --
Bad tests when temp was poorly kept & tests unreliable
6 c/o Hg 5 gm Cakes iron
150 Runs

			1 V	½
Thru	20	mesh	1605	2432
"	30	"	1800 ?	—
"	40	"	1647	2550
"	60	"	1675	2505
"	80	"	1725	2572
"	100	"	1822	2640
"	180	"	1375	1990

50 Runs 6 c/o Hg 5 gm Cake

Thru	30	on 40	1075
	40	on 50	1380
	50	on 60	1372
	60	on 70	1572
	70	on 80	1295
	100	on 180	1880
Thru	180		1705